PATENT SPECIFICATION

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785,363

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International Classification:—F21b.

COMPLETE SPECIFICATION

Counterpoise Suspension

We, THE AMALGAMATED DENTAL COMPANY LIMITED, of 26—40, Broadwick Street, London, W.1., a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to counterpoise suspension of the parallel movement type, incorporating a parallelogram linkage and a spring-loaded cross link urging the linkage to swing in one direction, in opposition to a load carried by the suspension and counterbalanced thereby. In one position of such suspensions the leverage exerted by the load is generally a maxmium, and displacement on either side of this central position causes a diminution in the leverage. However, with previous arrangements, swinging of the linkage from this central position caused a compensating diminution in spring loading only in one direction, whilst displacement in the other direction resulted in a continued increase in the spring thrust. In other words, the suspension was balanced only on one side of the central position.

According to the present invention, a suspension of the type referred to incorporates a cam and follower mechanism arranged to vary the spring thrust in response to displacement of the parallelogram linkage, in such a way as to provide a desired counterpoise action automatically over a predetermined range of displacement, the long links of the parallelogram being arranged to swing to both sides of a horizontal position, and carry a load exerting maximum leverage on the mounting member in that position, the profile and position of the cam being such as to cause a diminution in spring thrust as the long links are swung to one side of the horizontal, whilst the corresponding diminution on the other side of the horizontal is effected only by the sliding of the cross link.

In one well known arrangement of counterpoise suspension the cross link extends from a first pivotal point on the parallelogram linkage, to an intermediate position on the longer of the opposite links of the parallelogram, and is there slidably constrained to that link. The spring is a helical compression spring embracing the last mentioned link, constrained between a second pivotal point of the parallelogram and the sliding end of the cross link. The link between the first and second pivotal points of the parallelogram serves as a mounting member, and is normally fixed. though it may be adjustable.

On a change in configuration in the parallelogram, relative movement of the sliding end of the cross link occasions a change in the spring thrust. According to one embodiment of the present invention, the effect of this change is supplemented by a cam fitted adjacent the second pivotal point and fixed relative to the mounting member, associated with a follower against which the adjacent end of the spring abuts.

One embodiment of the invention is illustrated in the accompanying drawings of which:—

Figure 1 is a side, partly sectional view with a cover plate removed,

Figure 2 is a sectional view on the line II—II of Figure 1,

Figure 3 is a sectional view on the line III—III of Figure 1,

Figure 4 is a part-sectional view from below of the left-hand portion of Figure 1, with part of the cover plates cut away, and

Figure 5 is a view from above of the left-hand portion of Figure 1, with part of the cover plates cut away.

The suspension comprises a mounting member in the form of a metal plate 1 formed at one end as a saddle 2 and there connected by a vertical swivel pin 3 in the plane of the plate, to a support 4 for swinging about a vertical axis. At a first pivot point 5 in plate 1, there are pivotally attached a pair of

[*Price 3s. 6d.*]

dished steel sheets or cover plates 6 forming a sleeve, and at a second pivot point 7 vertically below the first is pivoted a bifurcated end fitting 8 of a tubular steel strut 9, housed within the sleeve. Strut 9 and the sleeve (plates 6) form the two long links of a parallelogram linkage, plate 1 forms one short link and a metal plate 10 (similar to plate 1 but without the hereinafter described cam profile) connected by a vertical swivel pin 11 to a support 12 for a load to be carried (not shown), forms the other short link. The latter is pivoted by a horizontal pin 13 to plates 6 and by another such pin 14 to a bifurcated end fitting 15 of strut 9.

Also pivoted at pivot point 5 is a second, flat strut 16 constituting a cross link shorter than strut 9 and parallel thereto, housed within plates 6. At its other end strut 16 is pivoted by a pin 17 to plates 6 and to a bearing 18 slidably engaged on strut 9. End fitting 8 is slotted at 19 and houses a roller 20 between its bifurcated limbs, mounted on a pin 21 extending through the slots and yoked by straps 22 to a bearing 23 (which may be integral with the straps) slidably engaged on strut 9. Between bearings 18 and 23 a helical compression spring 24 is fitted, urging roller 20 against the inner end of plate 1 which is profiled at 25 as a cam. This profile is substantially circular about pivot point 7 at its upper portion, but more sharply curved at its lower portion 26 so that, as the sleeve formed by plates 6 is depressed below the horizontal, bearing 23 recedes relative to the corresponding movement of bearing 18. In this way, the thrust of spring 24 is caused to diminish whether the sleeve is swung upwards or downwards from a horizontal position. The cam profile is arranged so that the resulting change in the thrust exerted by the spring, together with the leverage exerted by roller 20 on strut 9, give rise to a degree of counterpoise, within a predetermined range of displacement of the suspension balancing the load which is carried.

For fine adjustment purposes, bearing 18 incorporates a spring abutment 27 carried by a screw-threaded sleeve 28. The outer part of bearing 18 is in the form of a split sleeve formed with lugs 29 between which strut 16 is held by the pin 17.

For use with an electric lamp, wires 30 and a switch 31 are incorporated.

What we claim is:—

1. A counterpoise suspension of the type referred to incorporating a cam and follower mechanism arranged to vary the spring thrust in response to displacement of the parallelogram linkage, in such a way as to provide a desired counterpoise action automatically over a predetermined range of displacement, the long links of the parallelogram being arranged to swing to both sides of a horizontal position, and carry a load exerting maximum leverage on the mounting member in that position, the profile and position of the cam being such as to cause a diminution in spring thrust as the long links are swung to one side of the horizontal, whilst the corresponding diminution on the other side of the horizontal is effected only by the sliding of the cross link.

2. A suspension as set forth in Claim 1, in which the cross link extends from a first pivotal point on the parallelogram linkage, to an intermediate position on the longer of the opposite links of the parallelogram, being there slidably constrained to that link, the spring being a helical compression spring embracing the last-mentioned link, constrained between a second pivotal point of the parallelogram and the sliding end of the cross link, and in which the cam is fitted adjacent the second pivotal point and fixed relative to the link between the first and second pivotal points and is associated with a follower against which the adjacent end of the spring abuts, to supplement the change in spring thrust occasioned by a change in configuration of the parallelogram.

3. A counterpoise suspension substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

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PROVISIONAL SPECIFICATION

Counterpoise Suspension

We, THE AMALGAMATED DENTAL COMPANY LIMITED, of 26—40, Broadwick Street, London, W.1., a British Company, do hereby declare this invention to be described in the following statement:—

This invention relates to counterpoise suspension of the parallel movement type, incorporating a parallelogram linkage and a spring-loaded cross link urging the linkage to swing in one direction, in opposition to a load carried by the suspension and counterbalanced thereby. In one position of such suspensions the leverage exerted by the load is generally a maximum, and displacement on either side of this central position causes a diminution in the leverage. However, with previous arrangements, swinging of the linkage from this central position caused a compensating diminution in spring loading only in one direction, whilst displacement in the other direction resulted in a continued increase in the spring rate. In other words, the suspension was balanced only on one side of the central position.

According to the present invention, a suspension of the type referred to incorporates a cam and follower mechanism arranged to exert leverage on the linkage and/or to vary

the spring rate in response to displacement of the parallelogram linkage, in such a way as to provide automatically over a predetermined range of displacement, a desired counterpoise action supplementary to, or instead of, any change therein occasioned by the change in configuration of the parallelogram and cross linkage.

In one well known arrangement of counterpoise suspension the cross link extends from a first pivotal point on the parallelogram linkage, to an intermediate position on the longer of the opposite links of the parallelogram, and is there slidably constrained to that link. The spring is a helical compression spring embracing the last mentioned link, constrained between a second pivotal point of the parallelogram and the sliding end of the cross link. The link between the first and second pivotal points of the parallelogram serves as a mounting member, and is normally fixed, though it may be adjustable.

On a change in configuration in the parallelogram, relative movement of the sliding end of the cross link occasions a change in the spring rate. According to the present invention, the effect of this change may be supplemented by a cam fitted adjacent the second pivotal point and fixed relative to the mounting member, associated with a follower against which the adjacent end of the spring abuts.

It will be understood that the term "supplemented" may mean augmented, replaced or reversed, the changes being additive. In particular, where the long links of the parallelogram are arranged to swing to both sides of a horizontal position, and carry a load exerting maximum leverage on the mounting member in that position, the profile and position of the cam may be such as to cause a diminution in spring rate as the long links are swung to one side of the horziontal, whilst the corresponding diminution on the other side of the horizontal is effected only by the sliding of the cross link.

In one convenient arrangement the suspension comprises a mounting member in the form of a metal plate formed at one end as a saddle and there connected by a vertical swivel pin in the plane of the plate, to a support for swinging about a vertical axis. At a first pivot point in the plate, there are pivotally attached a pair of dished steel sheets forming a sleeve, and at a second pivot point vertically below the first is pivoted a bifurcated end fitting of a tubular steel strut, hereinafter referred to as the first strut, housed within the sleeve. The first strut and the sleeve form the two long links of a parallelogram linkage, the metal plate forms one short link and a similar metal plate (without the hereinafter described cam profile) connected by a vertical swivel pin to a support for a load to be carried, forms the other short link. The latter is pivoted by a horizontal pin to the sleeve, and by another such pin to a bifurcated end fitting to the first strut.

Also pivoted at the first pivot point is a second, flat strut shorter than the first strut and parallel thereto, housed within the sleeve. At its other end the second strut is pivoted to the sleeve and to a first bearing slidably engaged on the first strut. The end fitting pivoted at the second pivot point is slotted and houses a roller between its bifurcated limbs, mounted on a pin extending through the slots and yoked to a second bearing slidably engaged on the first strut. Between these bearings a helical compression spring is fitted, urging the roller against the inner end of the adjacent metal plate which is profiled as a cam. This profile is substantially circular about the second pivot point at its upper portion, but more sharply curved at its lower portion so that, as the sleeve is depressed below the horizontal, the second bearing recedes relative to the corresponding movement of the first bearing. In this way, the spring rate is caused to diminish whether the sleeve is swung upwards or downwards from a horizontal position. The cam profile is arranged so that the resulting change in the spring rate, together with the leverage exerted by the roller on the first strut, give rise to a degree of counterpoise, within a predetermined range of displacement of the suspension, balancing the load which is carried.

For fine adjustment purposes, the first bearing may incorporate a spring abutment carried by a sleeve movable relative to the second strut by a screw thread mechanism. Thus, this sleeve may be threaded within an outer, split sleeve formed with lugs between which the second strut is held by the respective pivot pin.

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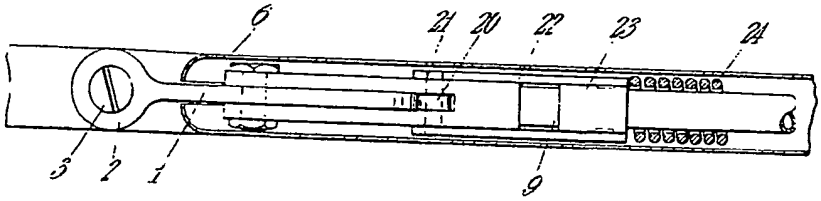
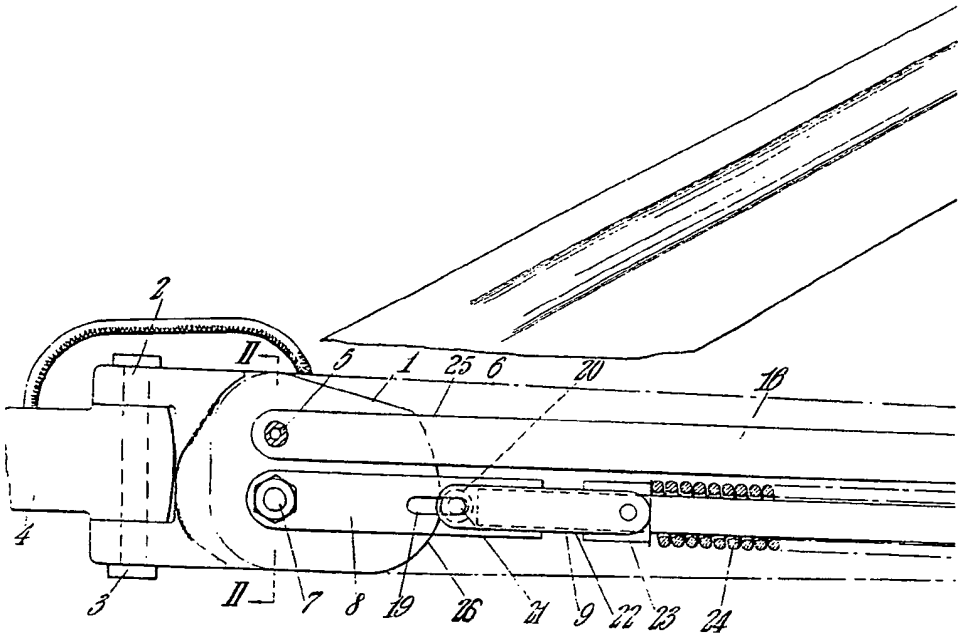


Fig. 4.



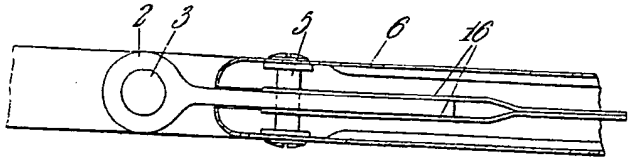


Fig. 5.

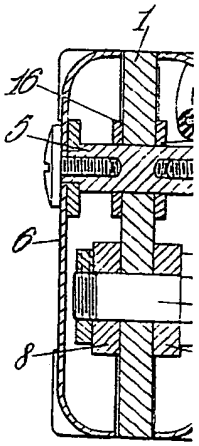


Fig. 2.

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1 SHEET This drawing is a reproduction of the Original on a reduced scale

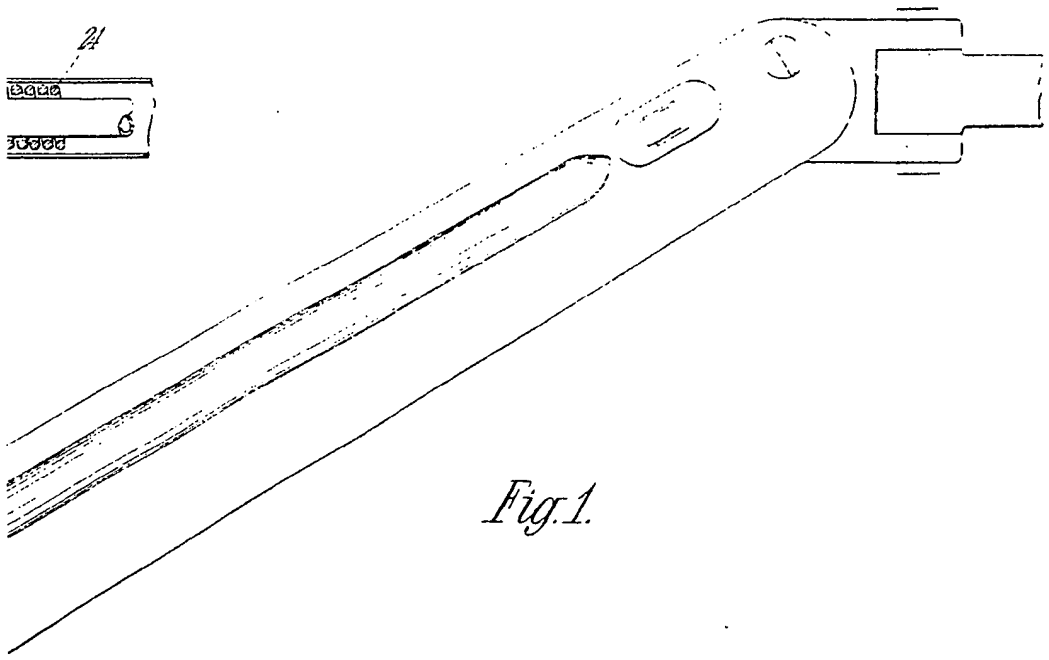
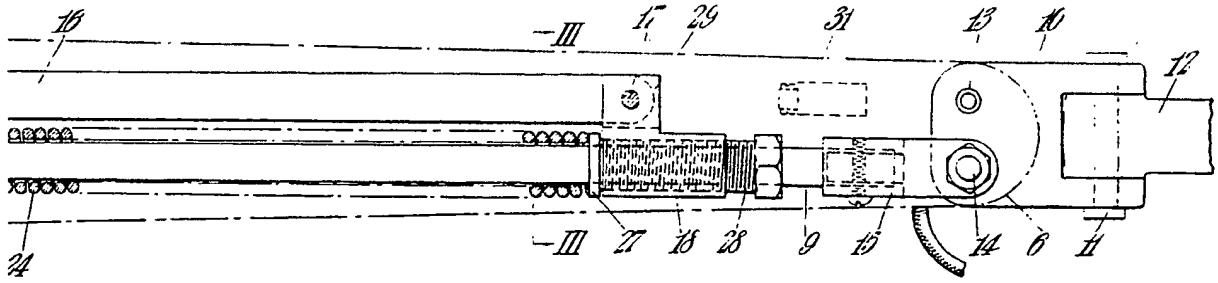


Fig.1.



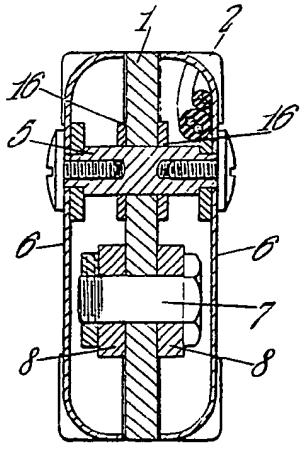


Fig.2.

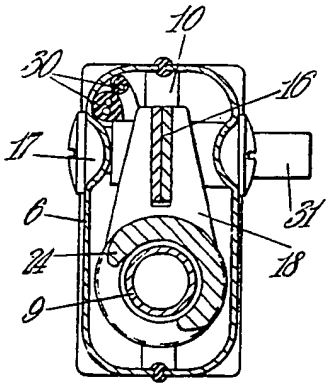


Fig.3.

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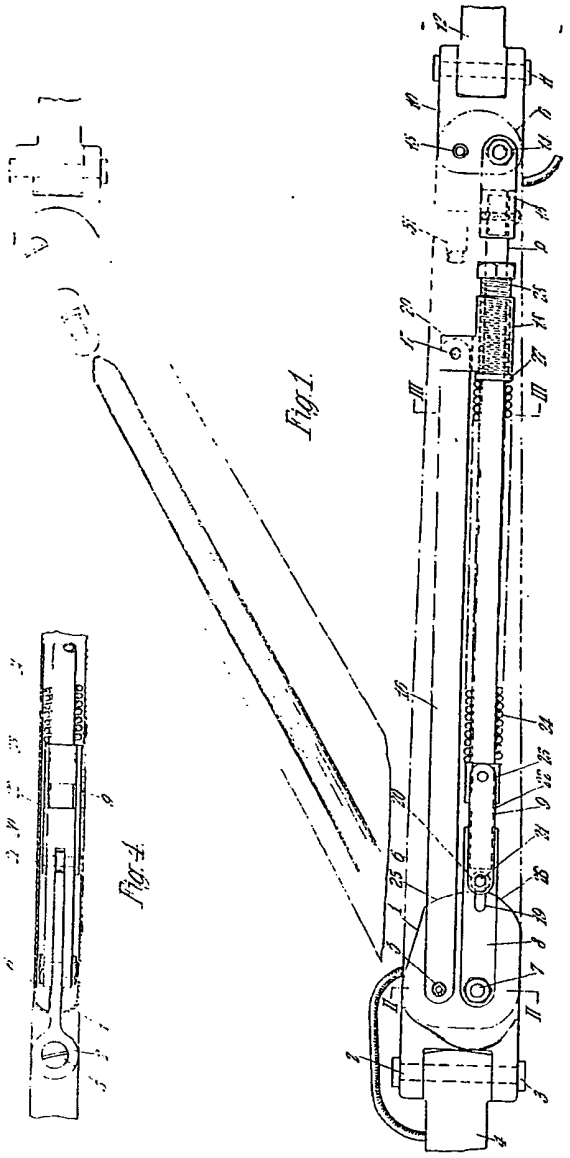

Fig. 1

Fig. 4

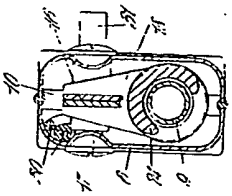

Fig. 5

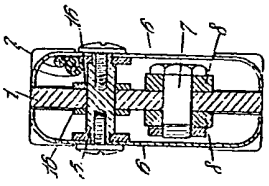

Fig. 2

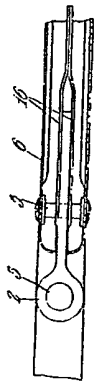

Fig. 3